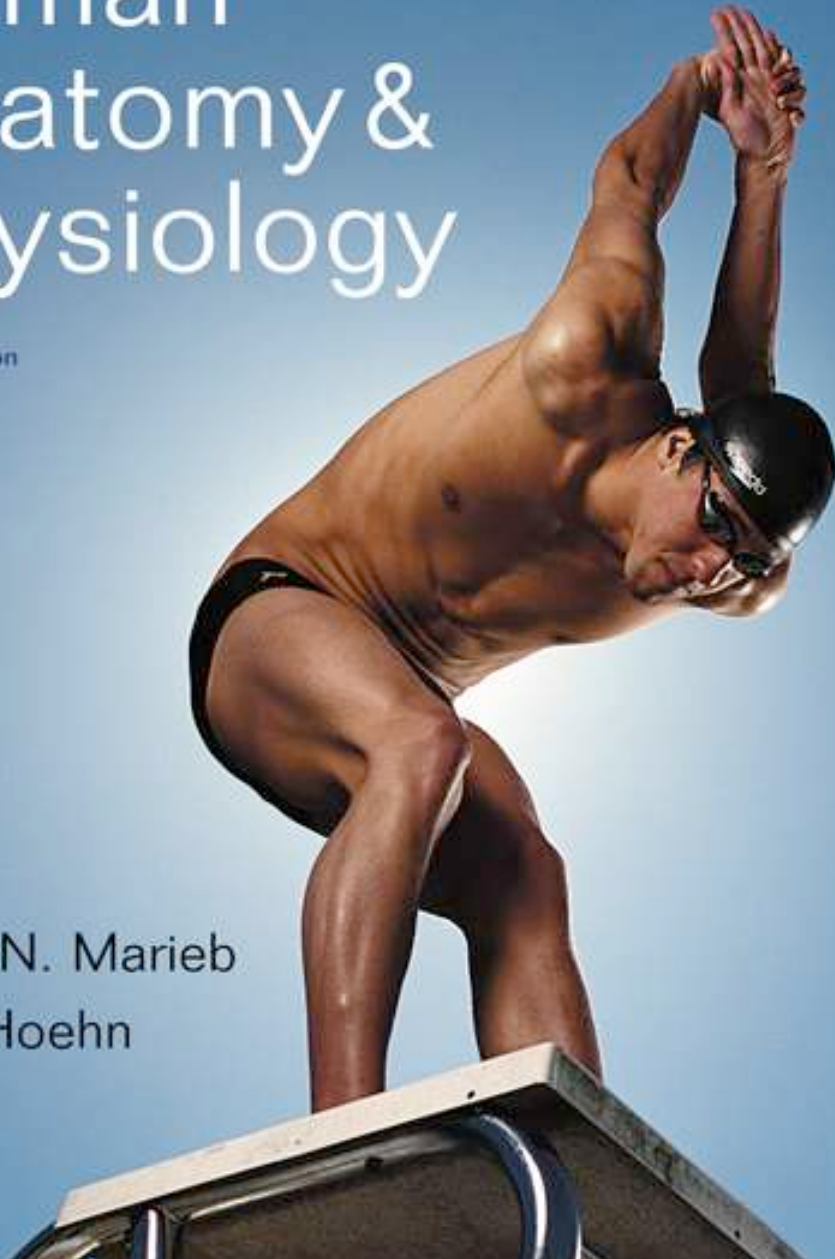


# Human Anatomy & Physiology

Eighth Edition

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Katja Hoehn



PowerPoint® Lecture Slides  
prepared by  
Janice Meeking,  
Mount Royal College

## CHAPTER 8

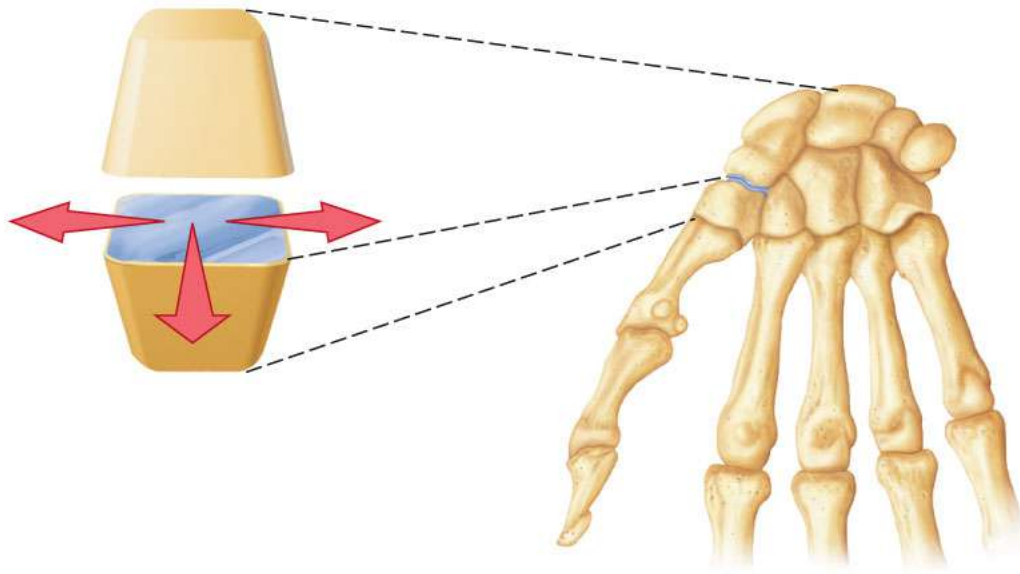
### Joints: Part B

# Classification of Synovial Joints

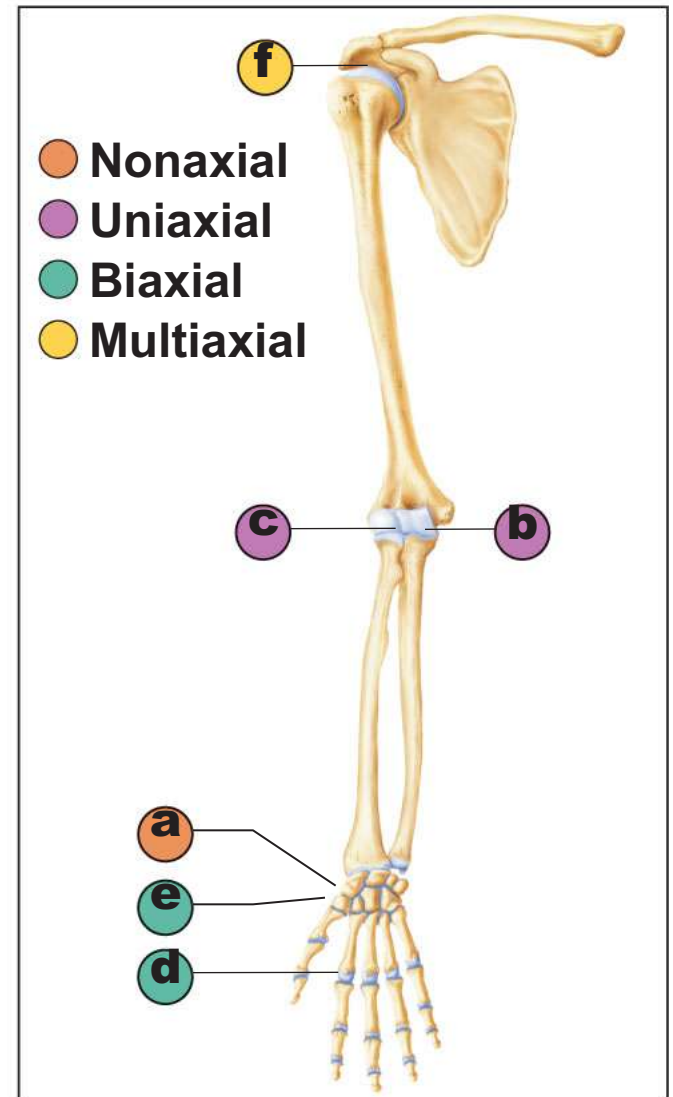
- Six types, based on shape of articular surfaces:
  - Plane
  - Hinge
  - Pivot
  - Condylloid
  - Saddle
  - Ball and socket

# Plane Joints - Characteristics

- Nonaxial joints
- Flat articular surfaces
- Short gliding movements



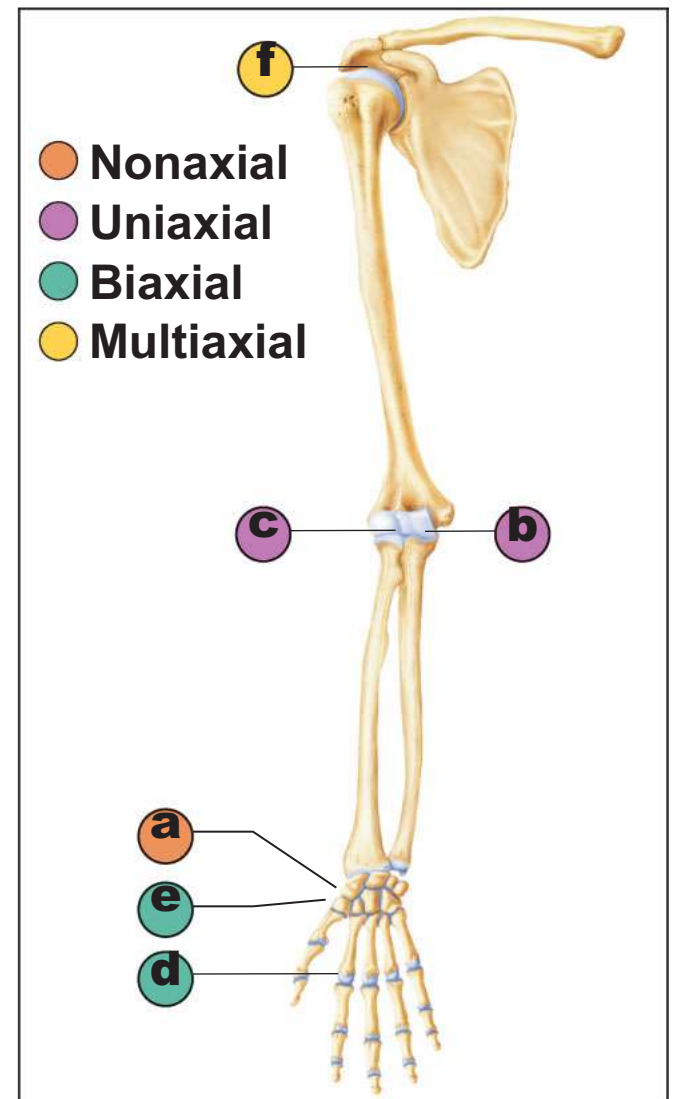
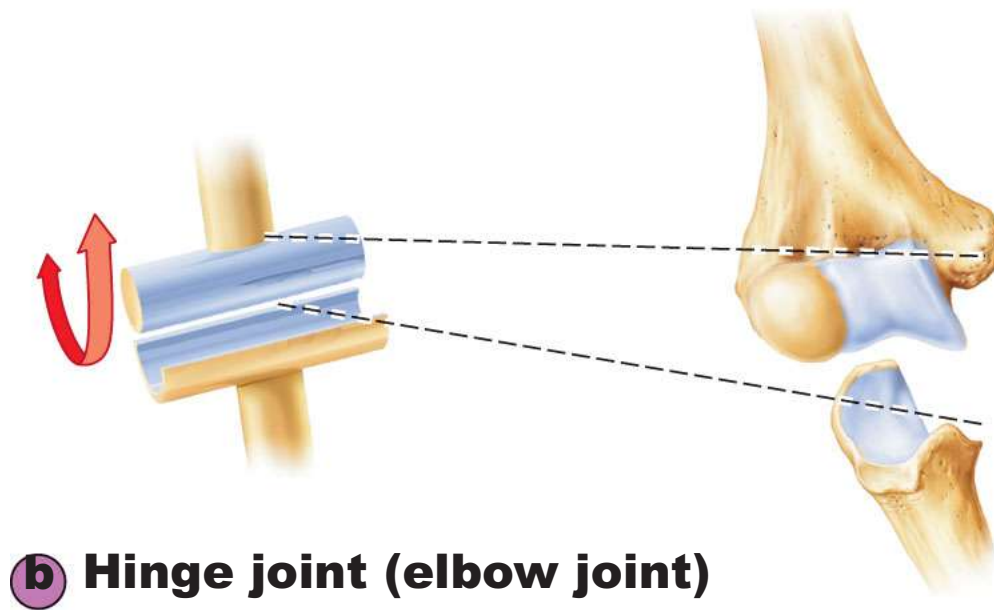
**a Plane joint (intercarpal joint)**



**Figure 8.7a**

# Hinge Joints - Characteristics

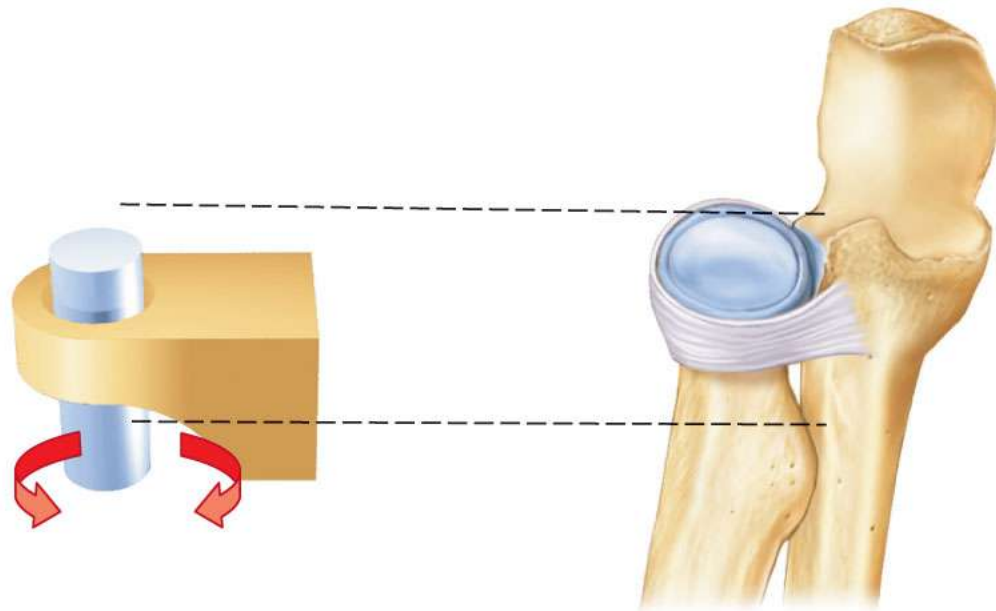
- Uniaxial joints
- Motion along a single plane
- Flexion and extension only



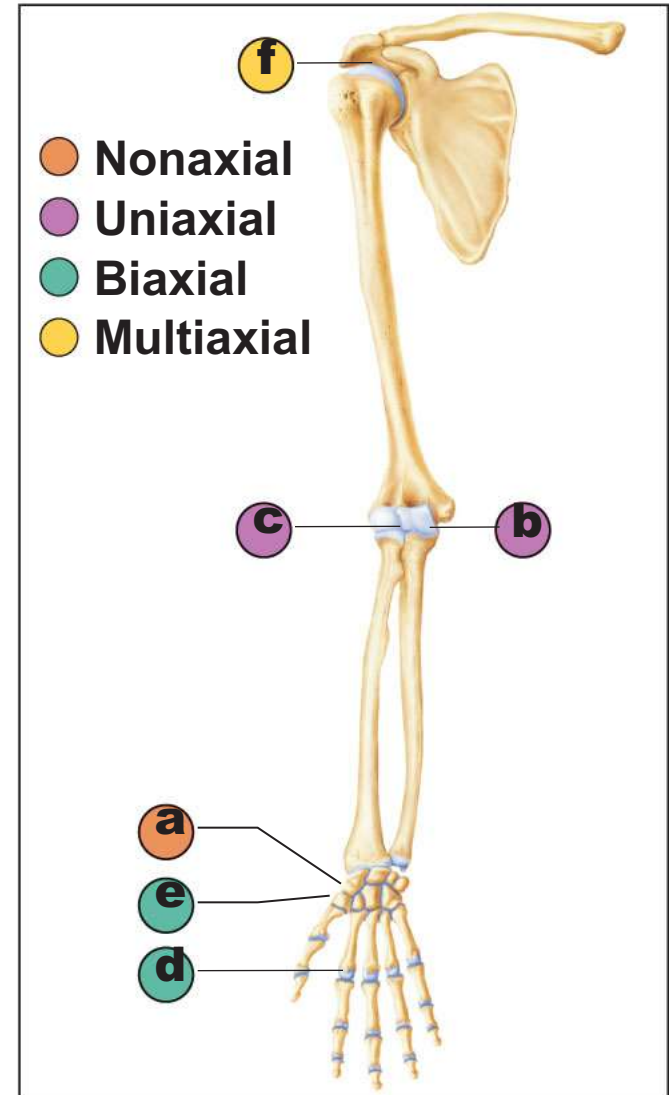
**Figure 8.7b**

# Pivot Joints - Characteristics

- Rounded end of one bone conforms to a “sleeve,” or ring of another bone
- Uniaxial movement only



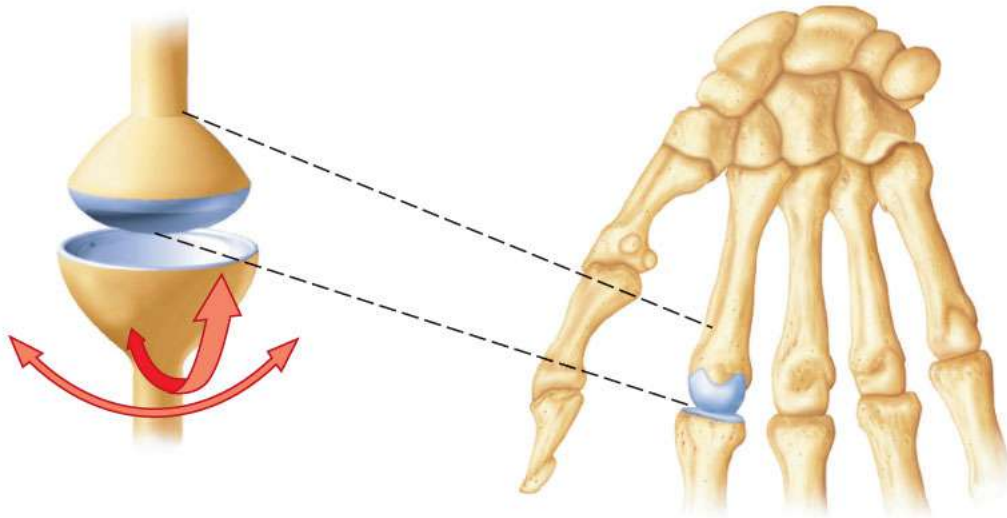
**© Pivot joint (proximal radioulnar joint)**



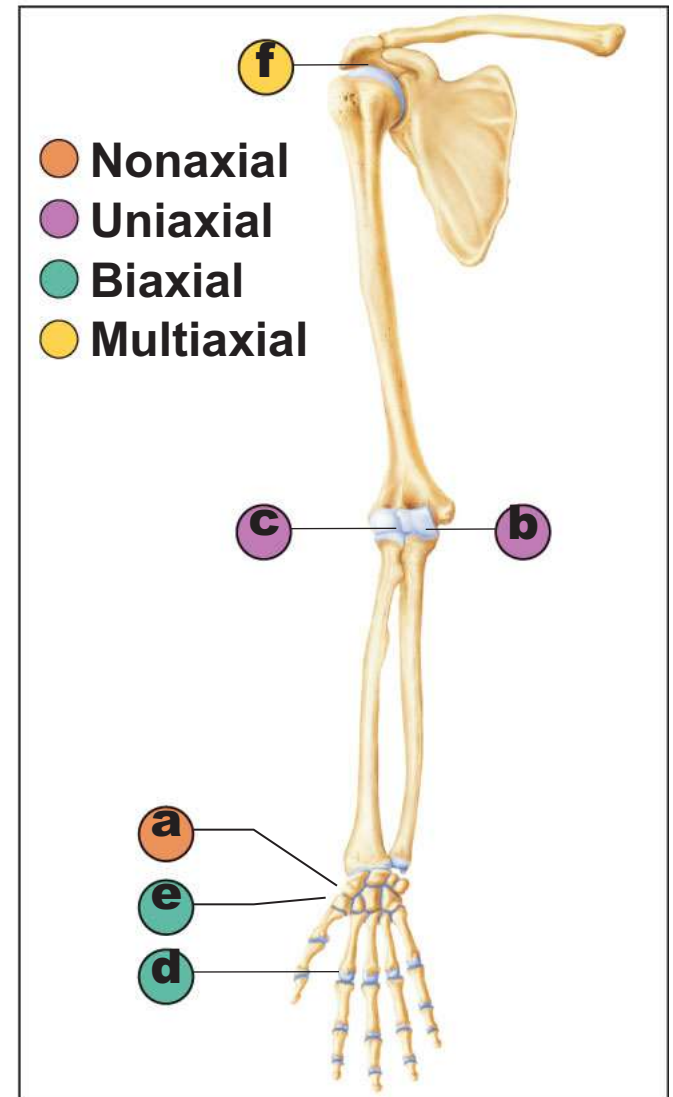
**Figure 8.7c**

# Condyloid (Ellipsoidal) Joints - Characteristics

- Biaxial joints
- Both articular surfaces are oval
- Permit all angular movements



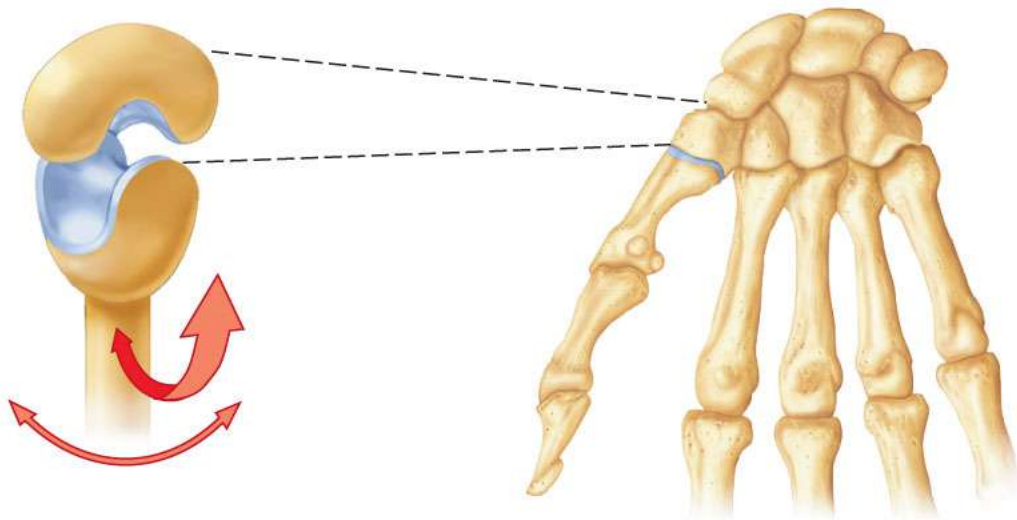
**d** Condyloid joint  
(metacarpophalangeal joint)



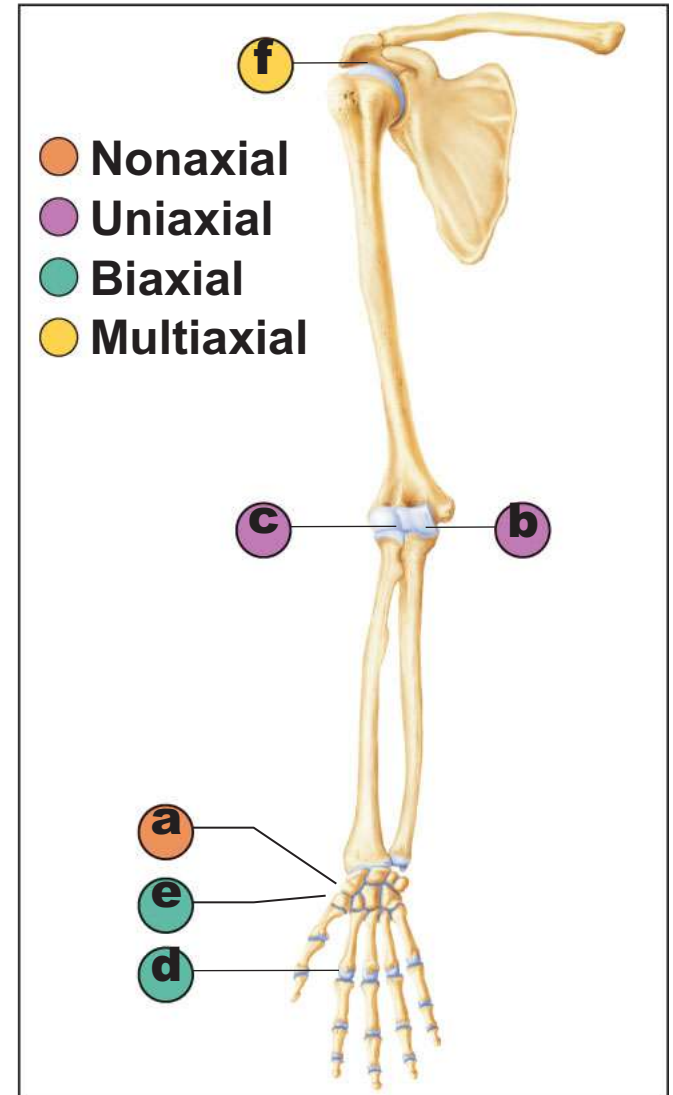
**Figure 8.7d**

# Saddle Joints - Characteristics

- Biaxial
- Allow greater freedom of movement than condyloid joints
- Each articular surface has both concave and convex areas



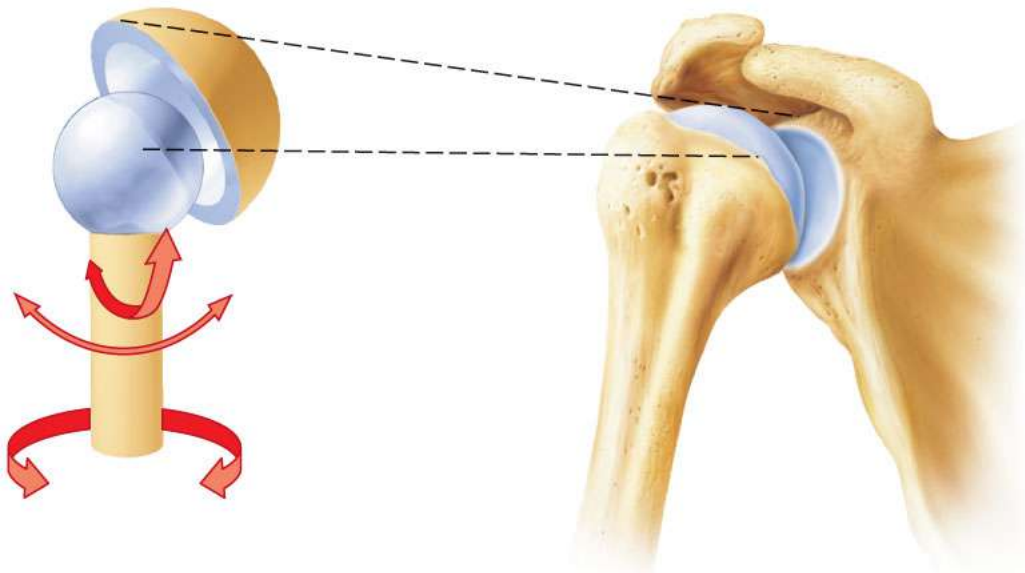
**e Saddle joint (carpometacarpal joint of thumb)**



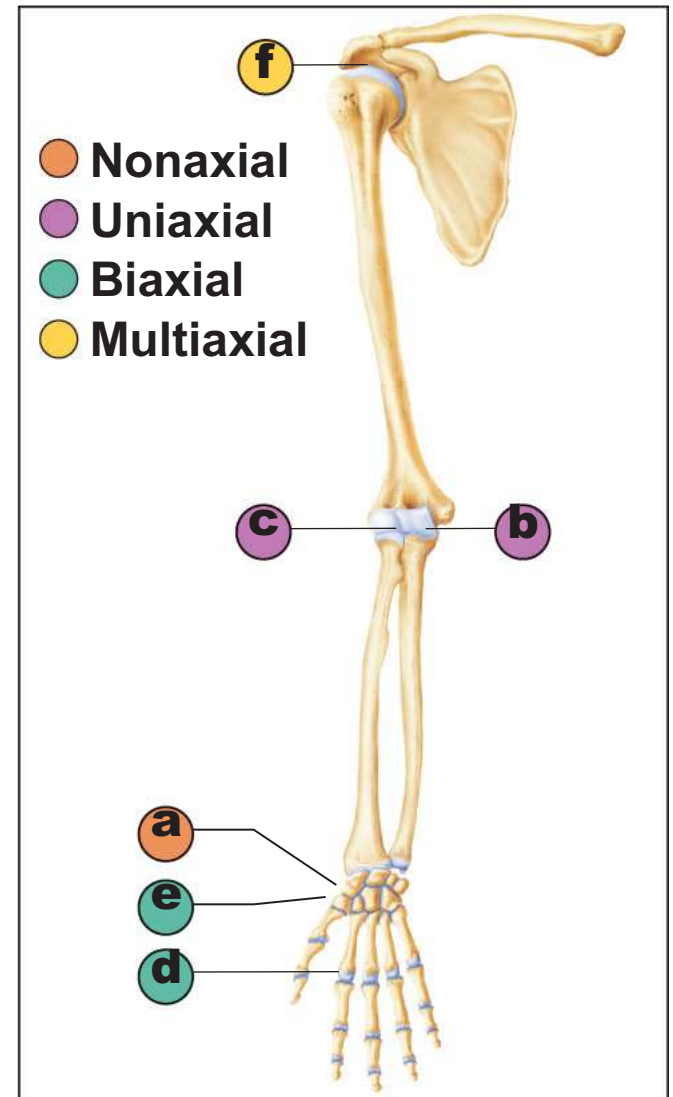
**Figure 8.7e**

# **Ball-and-Socket Joints - Characteristics**

- **Multiaxial joints**
- **The most freely moving synovial joints**



**f Ball-and-socket joint (shoulder joint)**



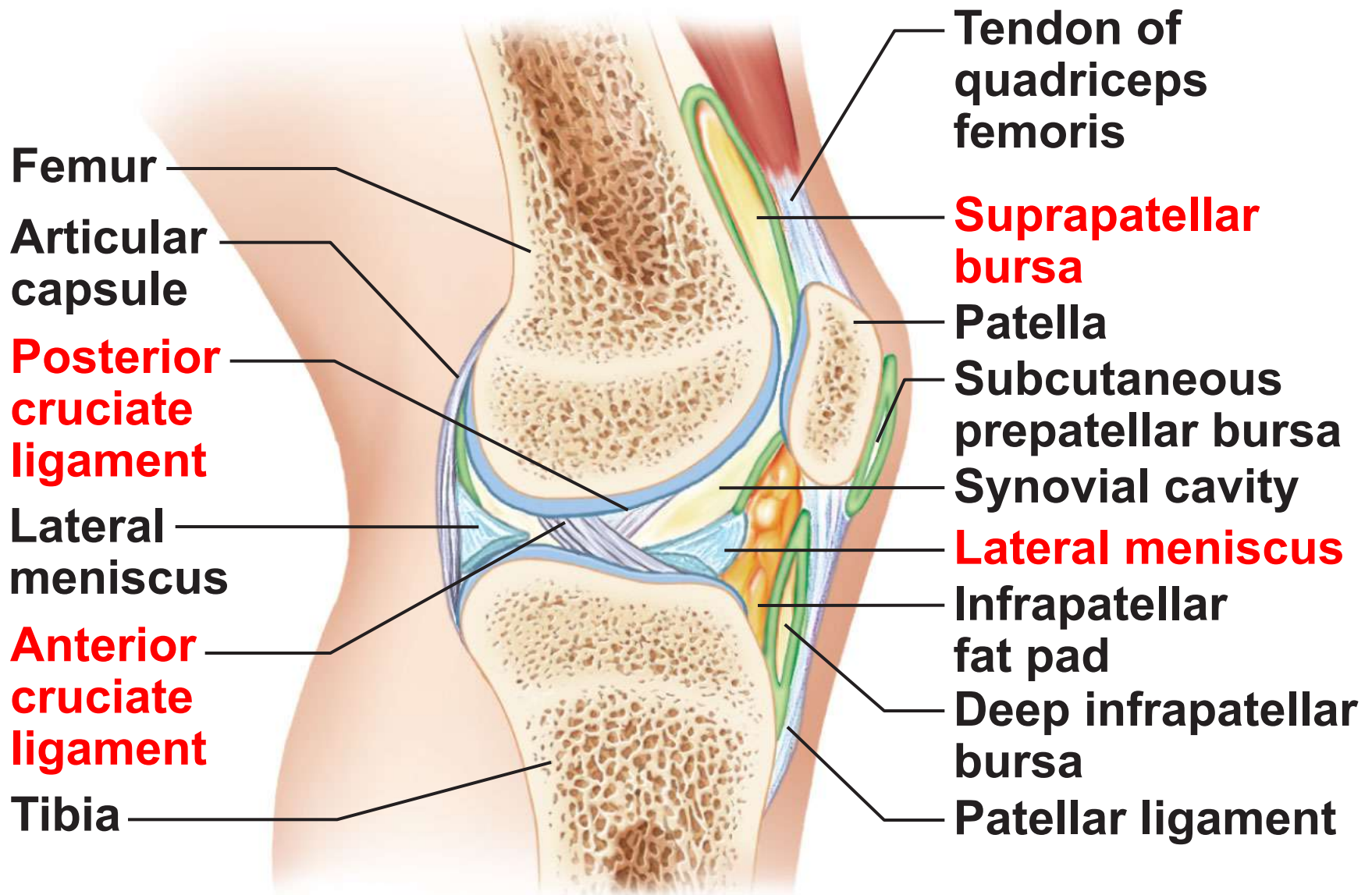
**Figure 8.7f**

# Knee Joint

- Largest, most complex joint of body
- Three joints surrounded by a single joint cavity:
  - Femoropatellar joint:
    - Plane joint
    - Allows **gliding motion** during knee flexion
  - **Lateral and medial tibiofemoral joints** between the femoral condyles and the C-shaped lateral and medial menisci (semilunar cartilages) of the tibia
    - Allow **flexion, extension, and some rotation** when knee is partly flexed

PLAY

**A&P Flix™: Movement at the knee joint**



**(a) Sagittal section through the right knee joint**

*Anterior*

**Anterior  
cruciate  
ligament**

**Articular  
cartilage  
on medial  
tibial  
condyle**

**Articular  
cartilage on  
lateral tibial  
condyle**

**Medial  
meniscus**

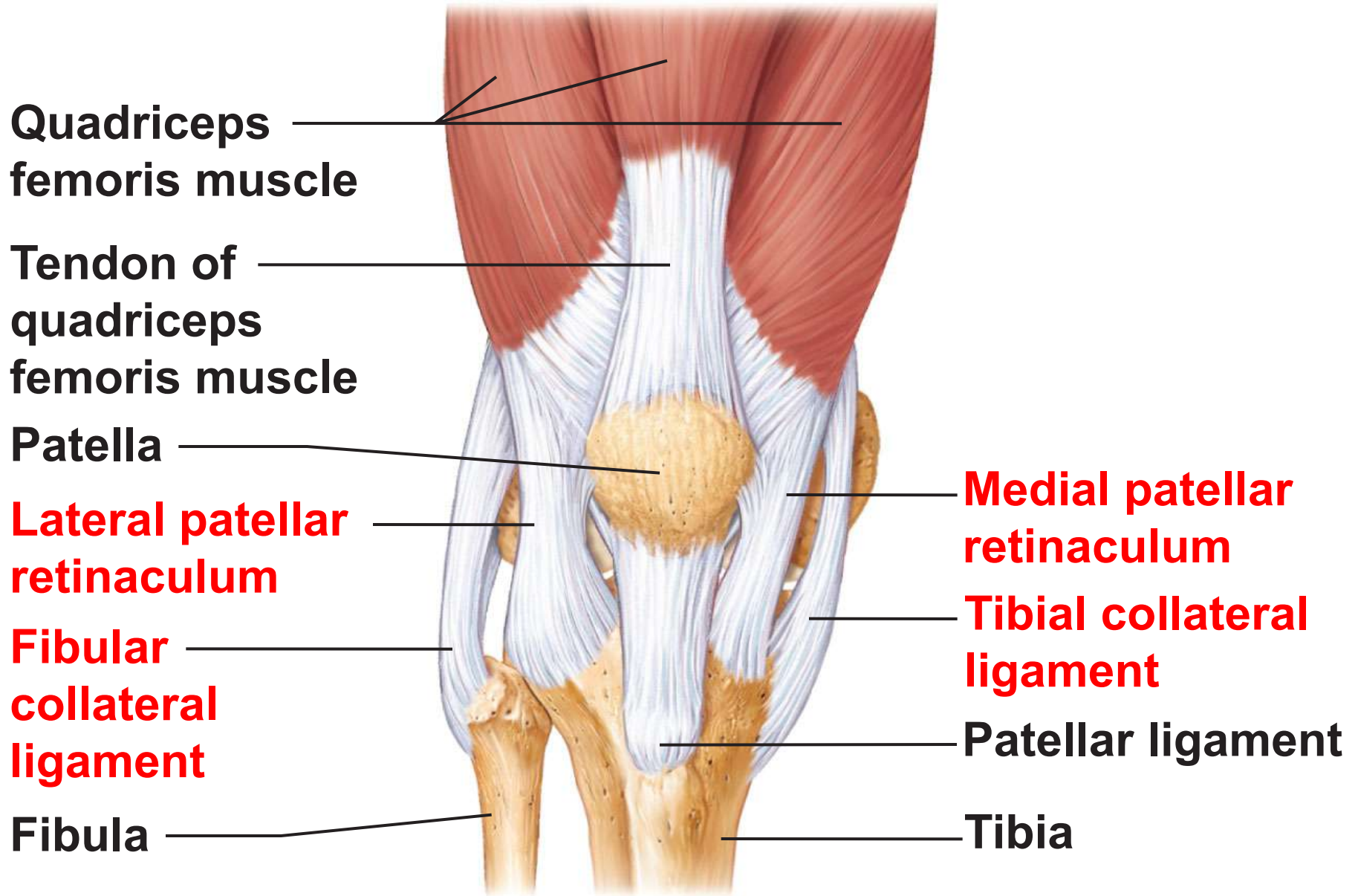
**Posterior  
cruciate  
ligament**

**Lateral  
meniscus**

**(b) Superior view of the right tibia in the knee joint, showing the menisci and cruciate ligaments**

# Knee Joint

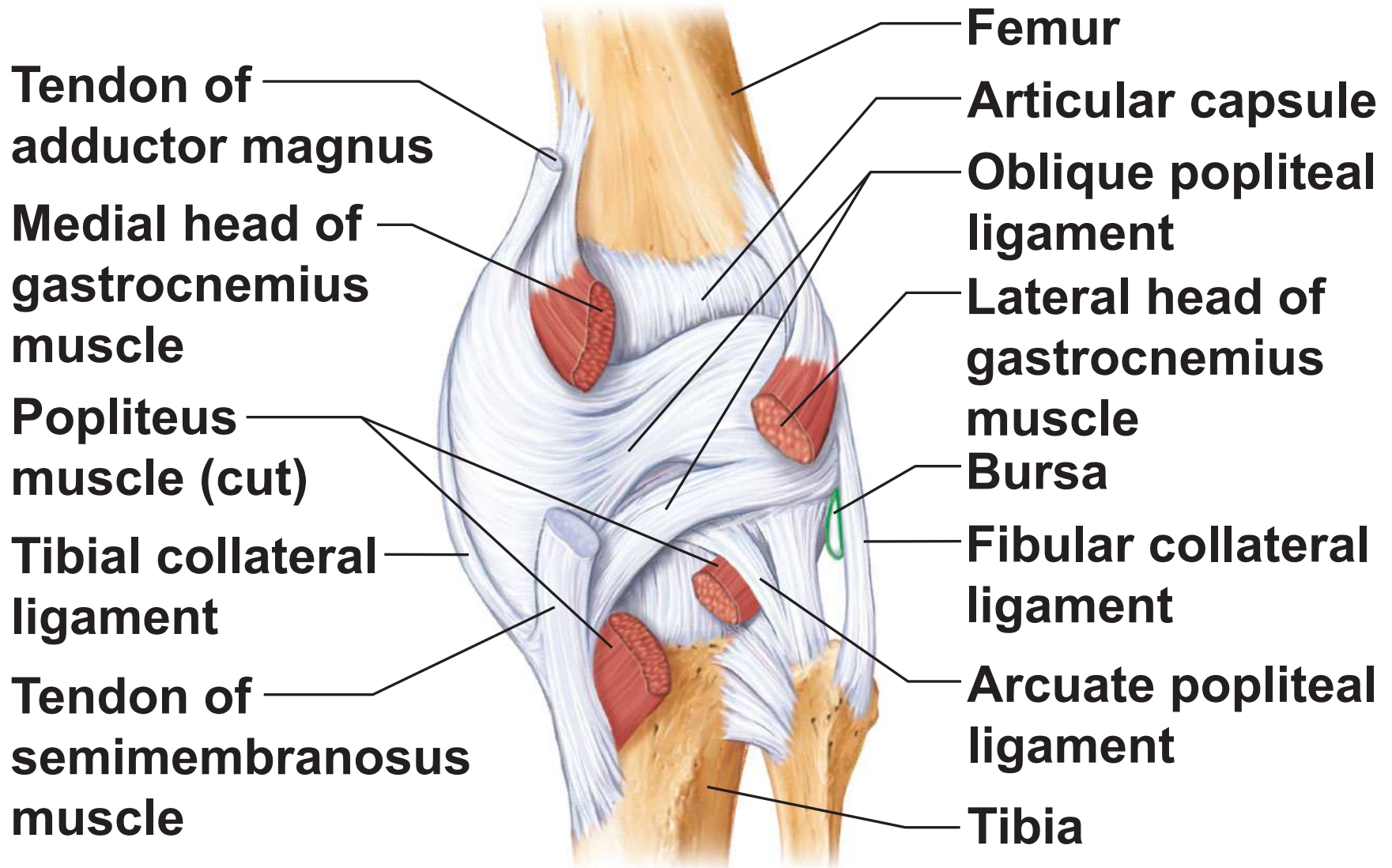
- At least 12 associated bursae
- Capsule is reinforced by muscle tendons:
  - E.g., quadriceps and semimembranosus tendons
- Joint capsule is thin and absent anteriorly
- Anteriorly, the quadriceps tendon gives rise to:
  - Lateral and medial patellar retinacula
  - Patellar ligament



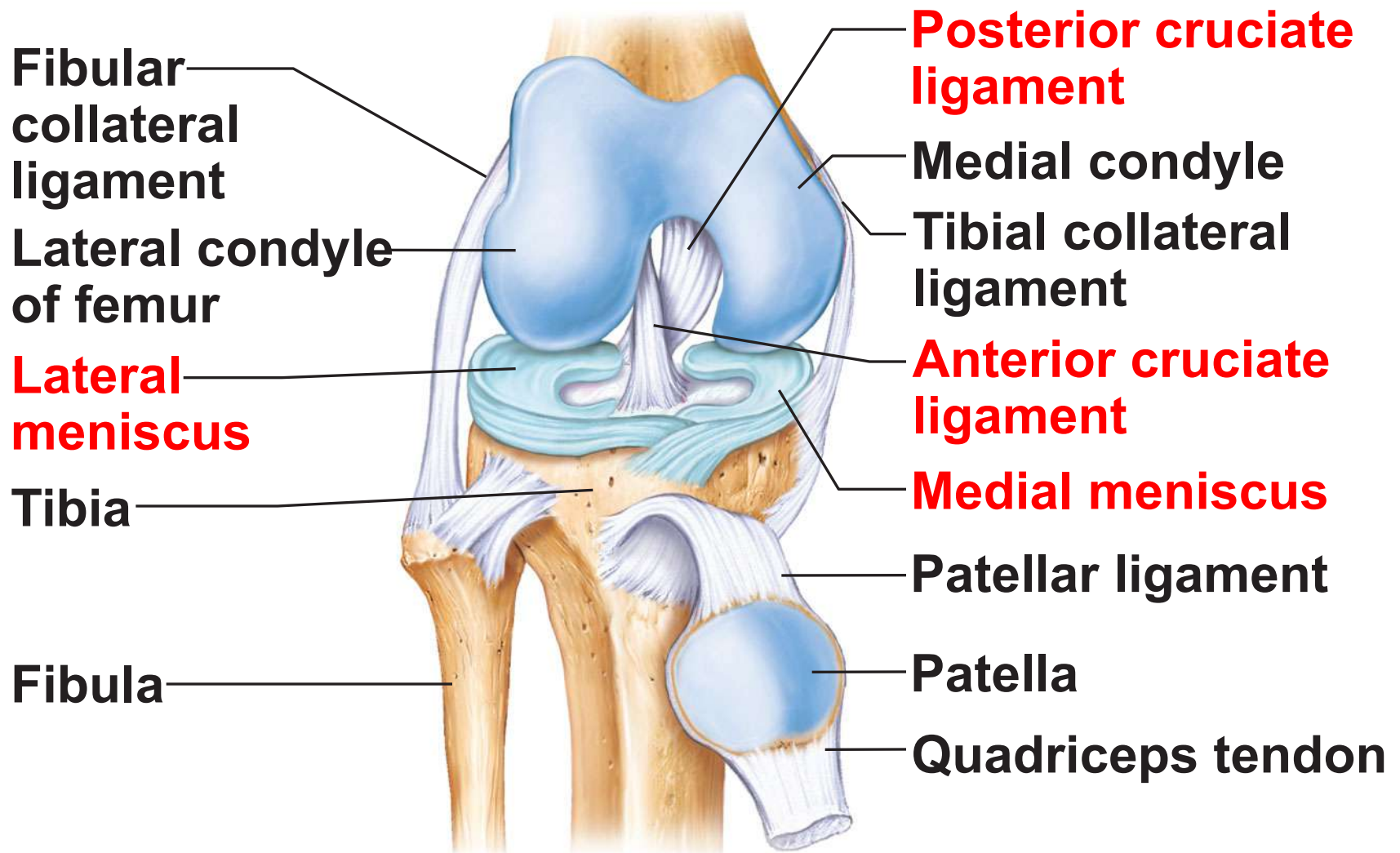
**(c) Anterior view of right knee**

# Knee Joint

- Capsular and extracapsular ligaments
  - Help prevent hyperextension
- Intracapsular ligaments:
  - Anterior and posterior cruciate ligaments
  - Prevent anterior-posterior displacement
  - Reside outside the synovial cavity



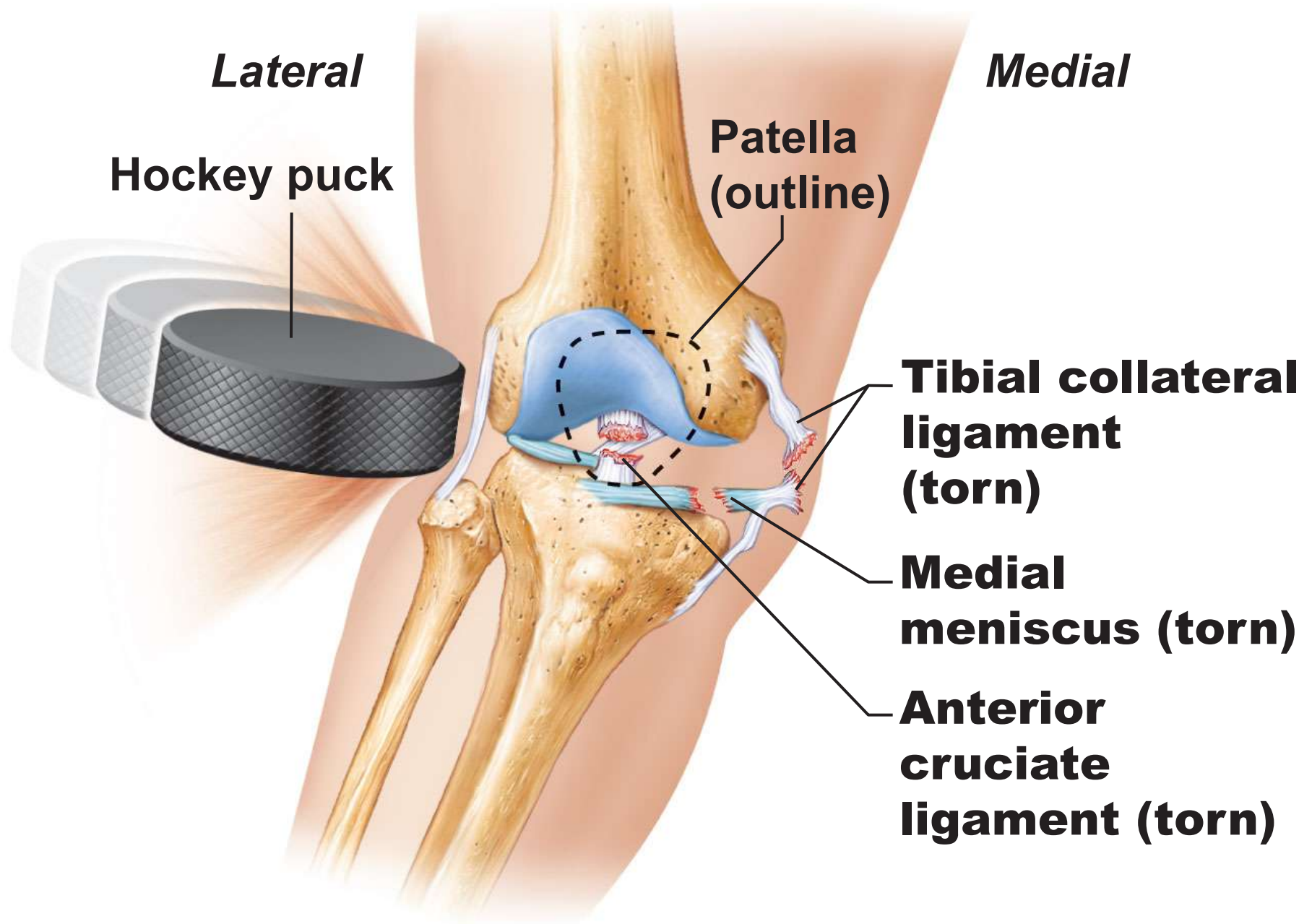
**(d) Posterior view of the joint capsule, including ligaments**



**(e) Anterior view of flexed knee, showing the cruciate ligaments (articular capsule removed, and quadriceps tendon cut and reflected distally)**

PLAY

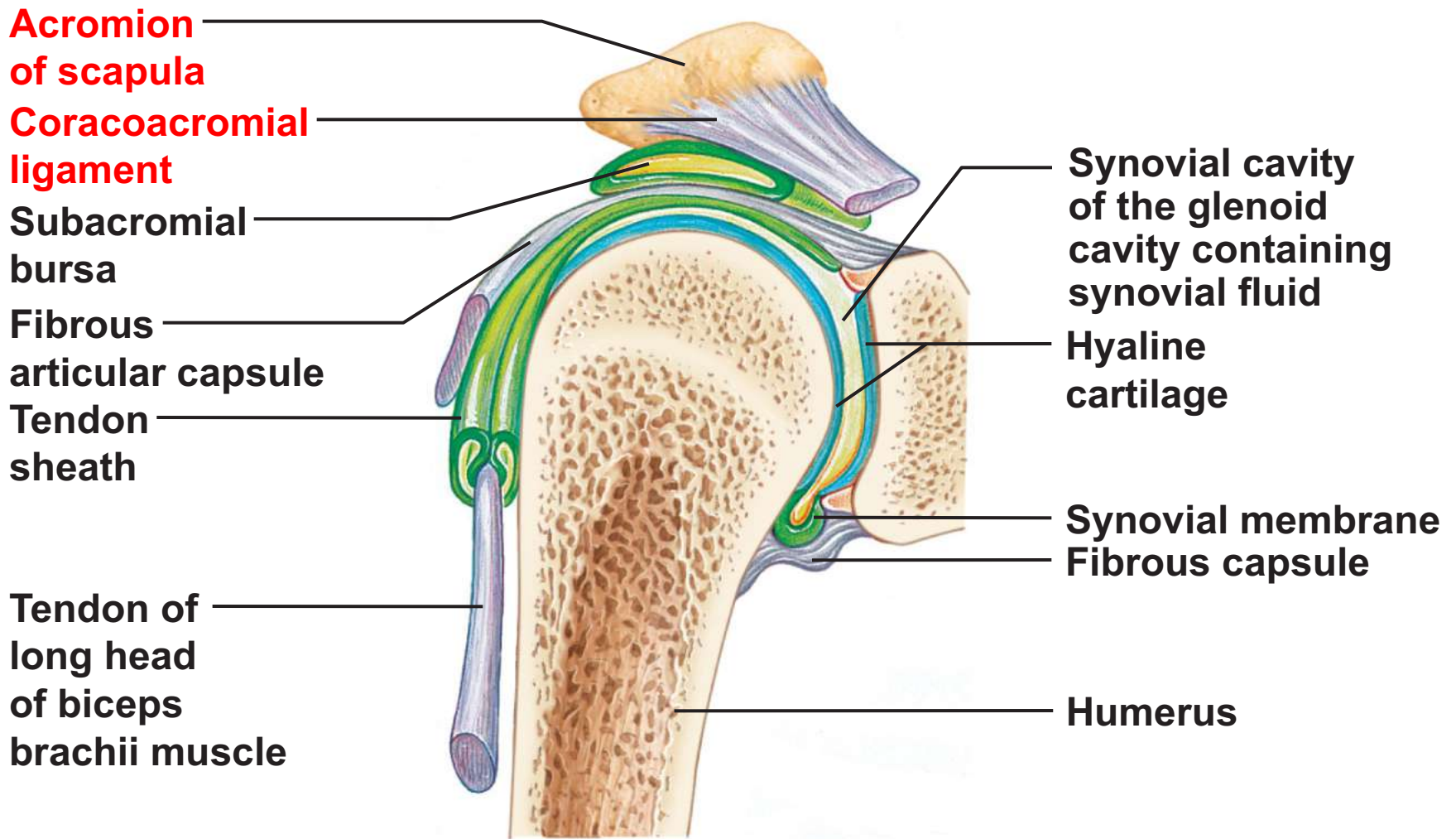
Animation: Rotating knee



**Figure 8.9**

# Shoulder (Glenohumeral) Joint

- Ball-and-socket joint: head of humerus and glenoid fossa of the scapula
- Stability is sacrificed for greater freedom of movement



**(a) Frontal section through right shoulder joint**

**PLAY**

**Animation: Rotating shoulder**

# Shoulder Joint

- Reinforcing ligaments:
  - Coracohumeral ligament—helps support the weight of the upper limb
  - Three glenohumeral ligaments—somewhat weak anterior reinforcements

# Shoulder joint

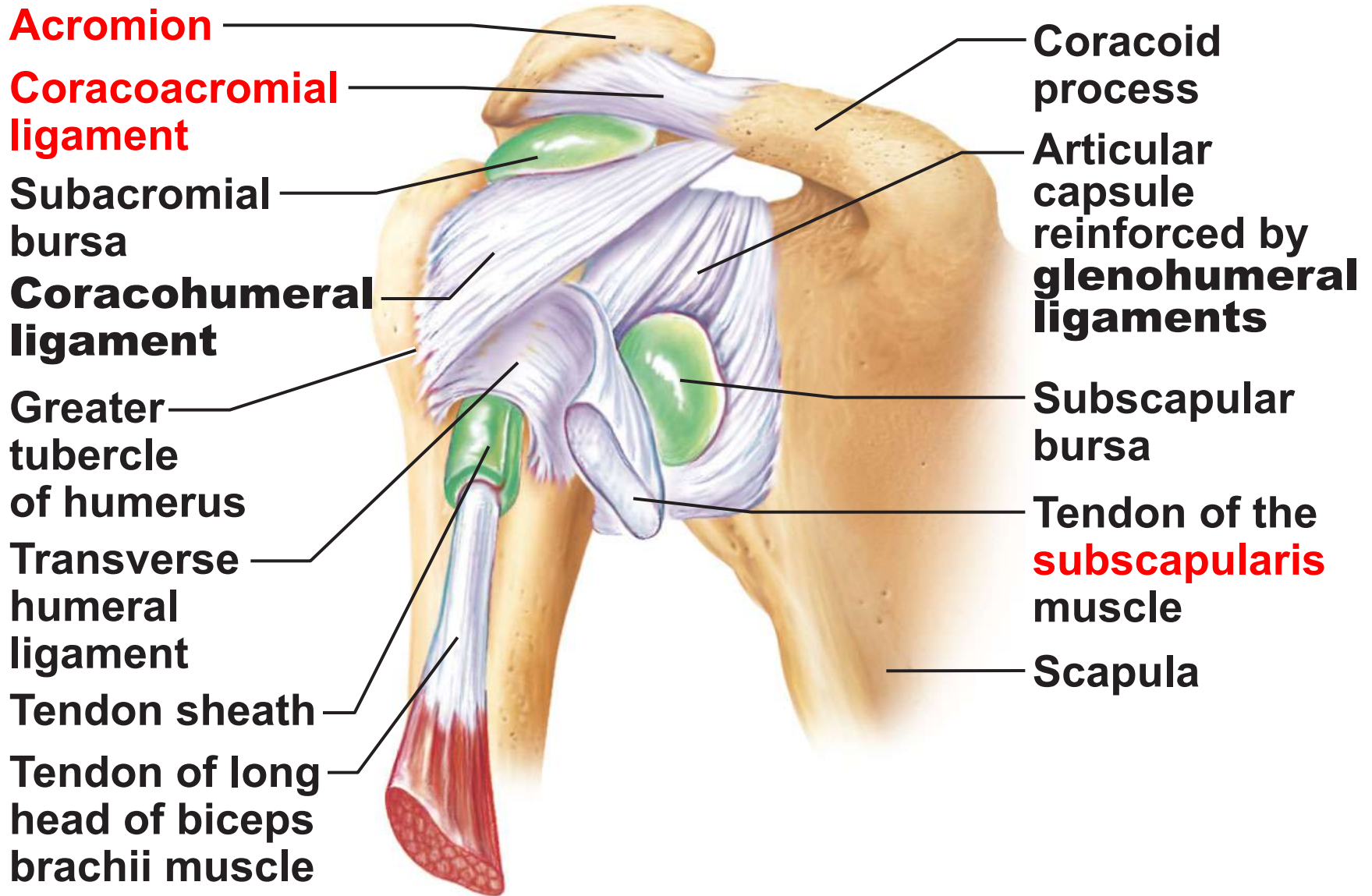
- Reinforcing muscle tendons:
  - Tendon of the long head of biceps:
    - Travels through the intertubercular groove
    - Secures the humerus to the glenoid cavity
  - Four rotator cuff tendons encircle the shoulder joint:
    - Subscapularis
    - Supraspinatus
    - Infraspinatus
    - Teres minor

PLAY

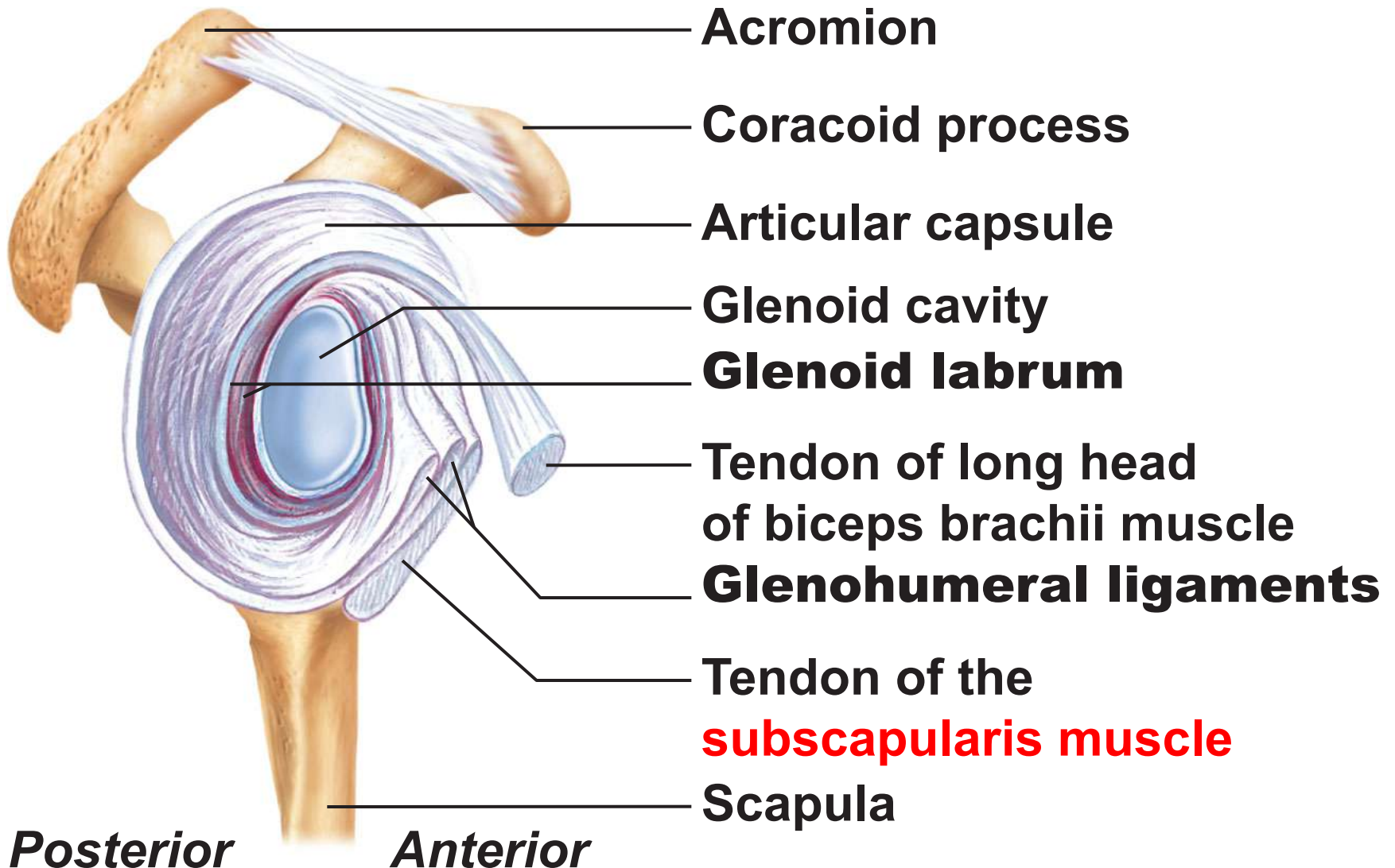
**A&P Flix™: Rotator cuff muscles: An overview (a)**

PLAY

**A&P Flix™: Rotator cuff muscles: An overview (b)**



**(c) Anterior view of right shoulder joint capsule**



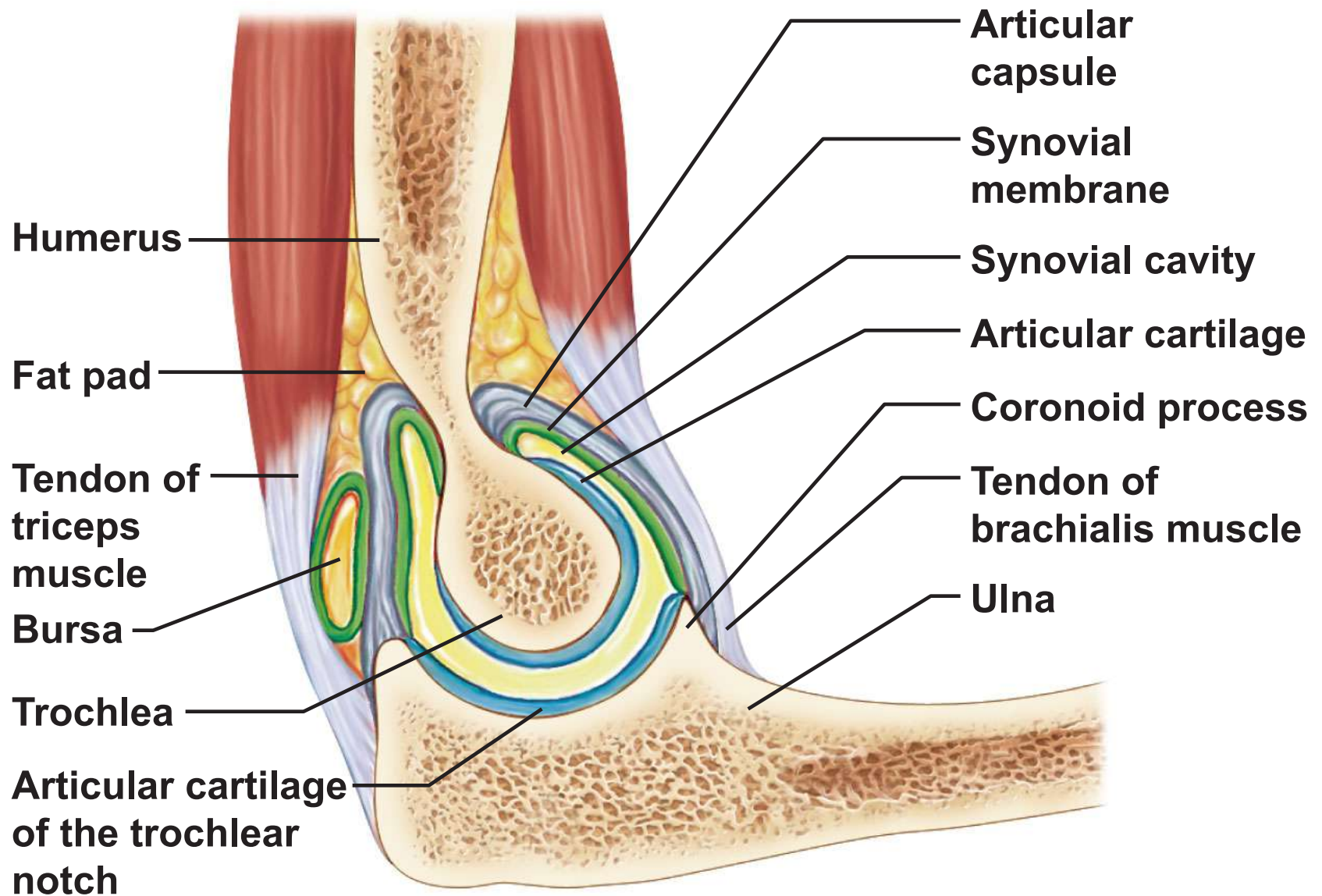
**(d) Lateral view of socket of right shoulder joint, humerus removed**

# Elbow Joint

- Radius and ulna articulate with the humerus
- Hinge joint formed mainly by trochlear notch of ulna and trochlea of humerus
- Flexion and extension only



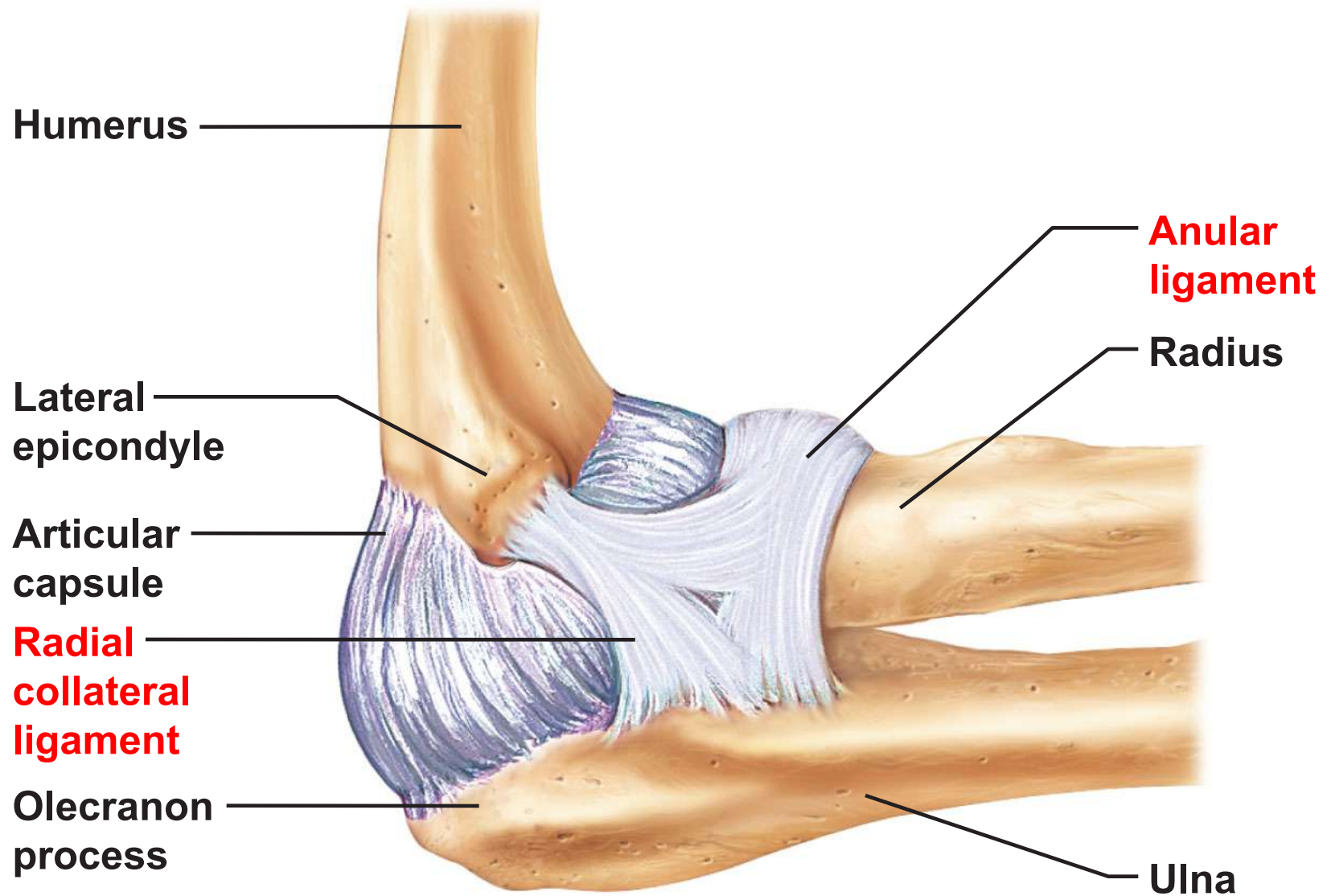
***A&P Flix™*: Movement at the elbow joint**



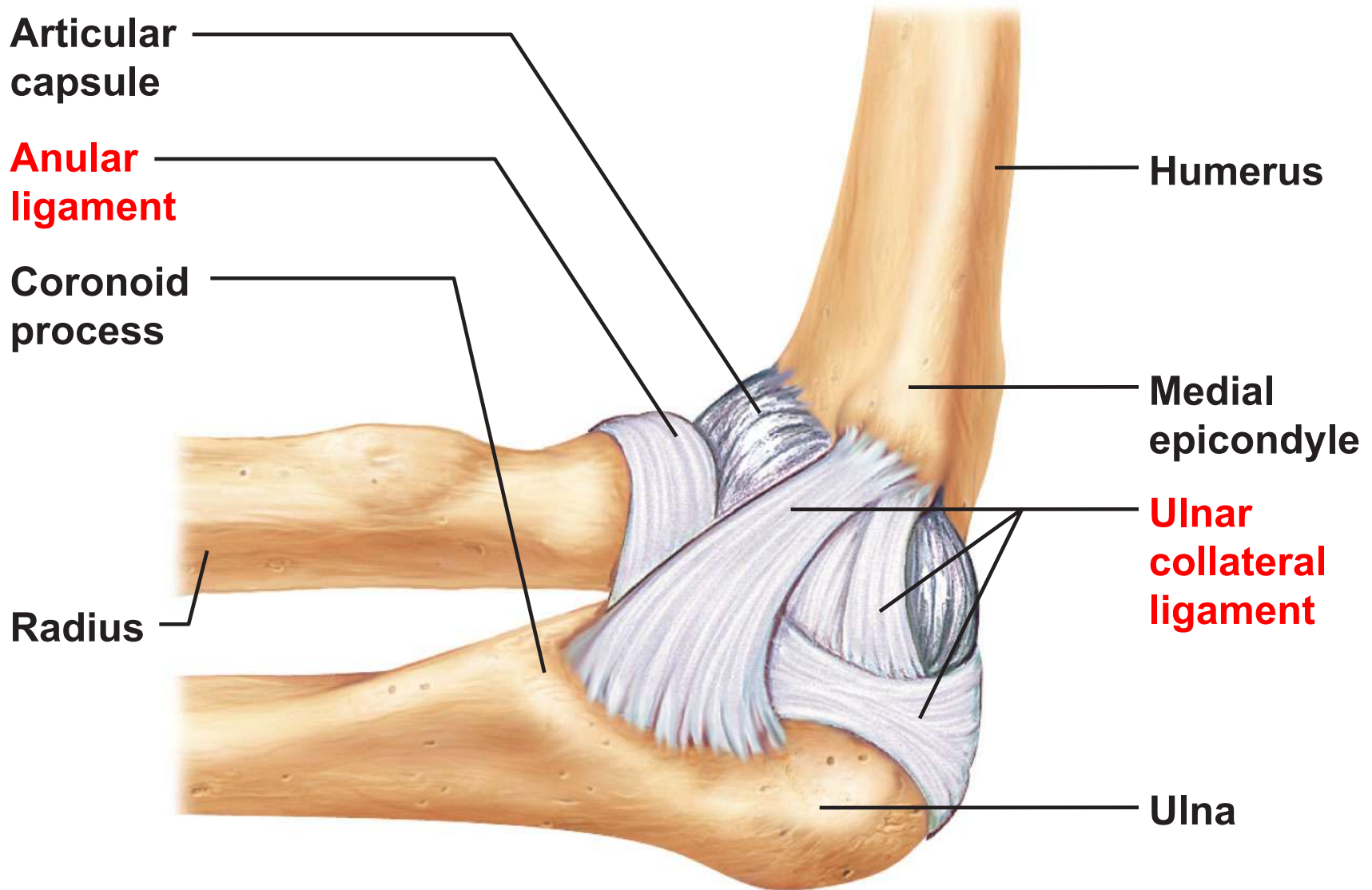
**(a) Median sagittal section through right elbow (lateral view)**

# Elbow Joint

- Anular ligament—surrounds head of radius
- Two capsular ligaments restrict side-to-side movement:
  - Ulnar collateral ligament
  - Radial collateral ligament



**(b) Lateral view of right elbow joint**



**(d) Medial view of right elbow**



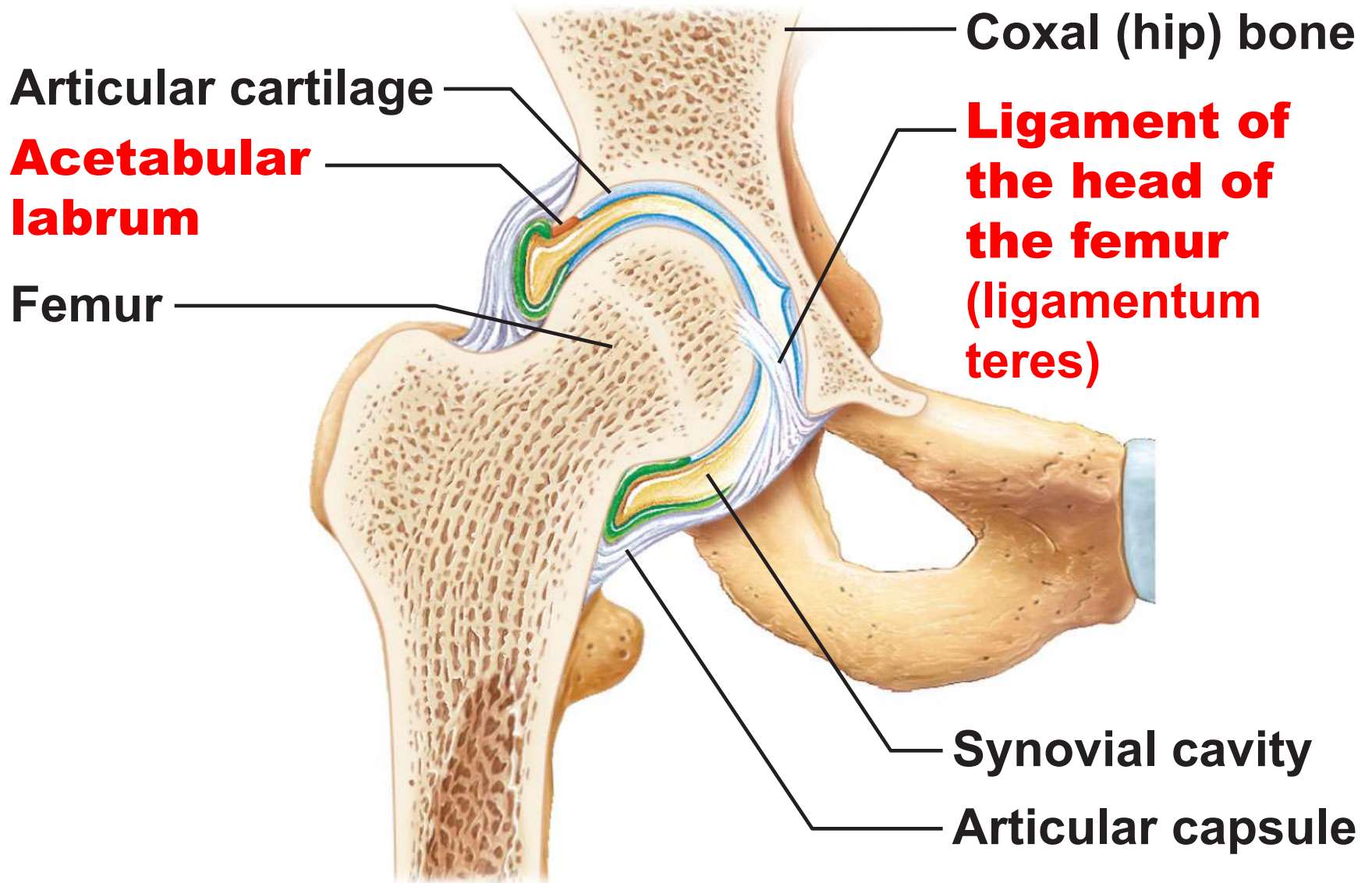
**Animation: Rotating elbow**

# Hip (Coxal) Joint

- Ball-and-socket joint
- Head of the femur articulates with the acetabulum
- Good range of motion, but limited by the deep socket
- Acetabular labrum—enhances depth of socket



**A&P Flix™: Movement at the hip joint: An overview**

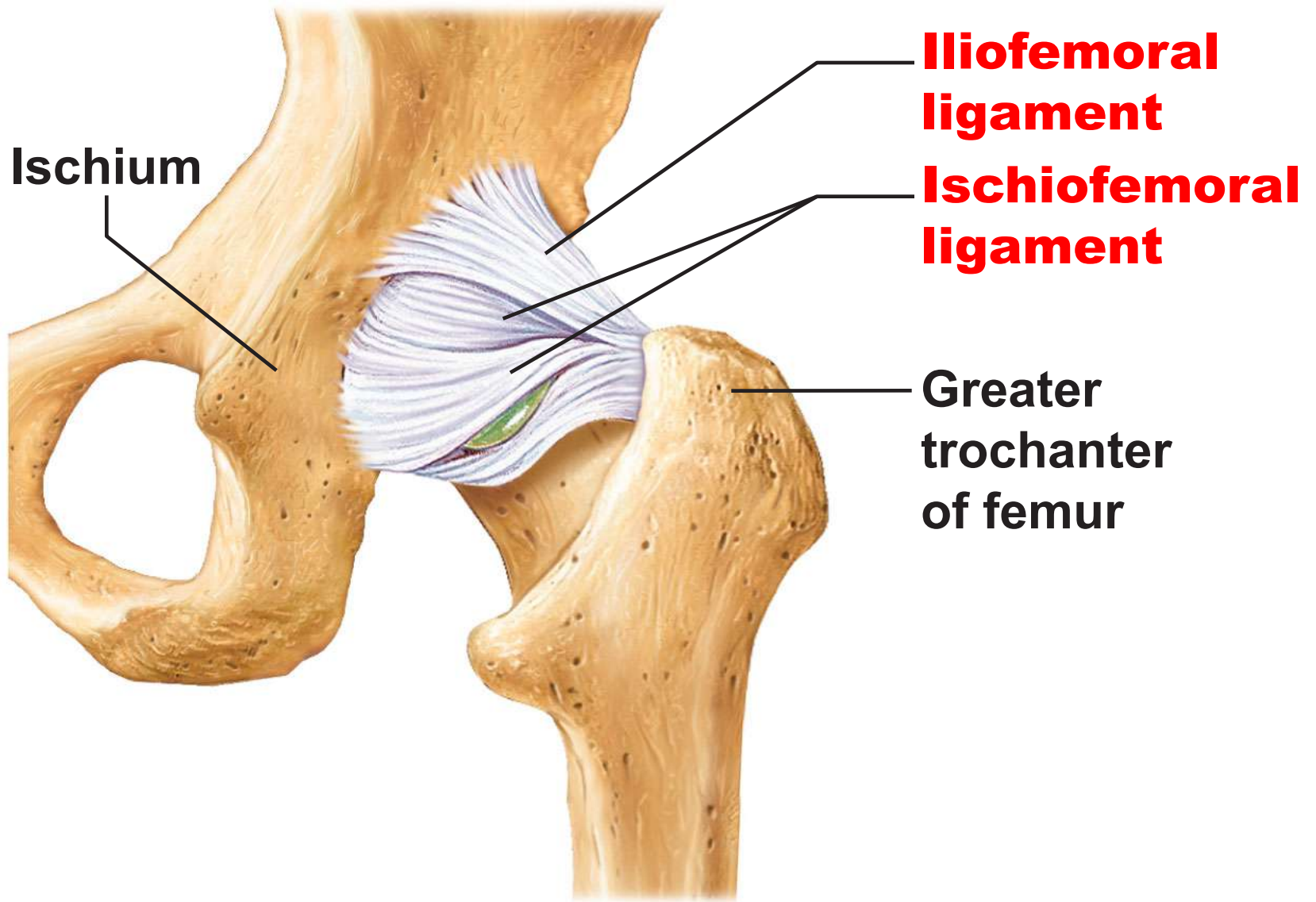


**(a) Frontal section through the right hip joint**

# Hip Joint

## Reinforcing ligaments:

- Iliofemoral ligament
- Pubofemoral ligament
- Ischiofemoral ligament
- Ligamentum teres



**(c) Posterior view of right hip joint, capsule in place**

PLAY

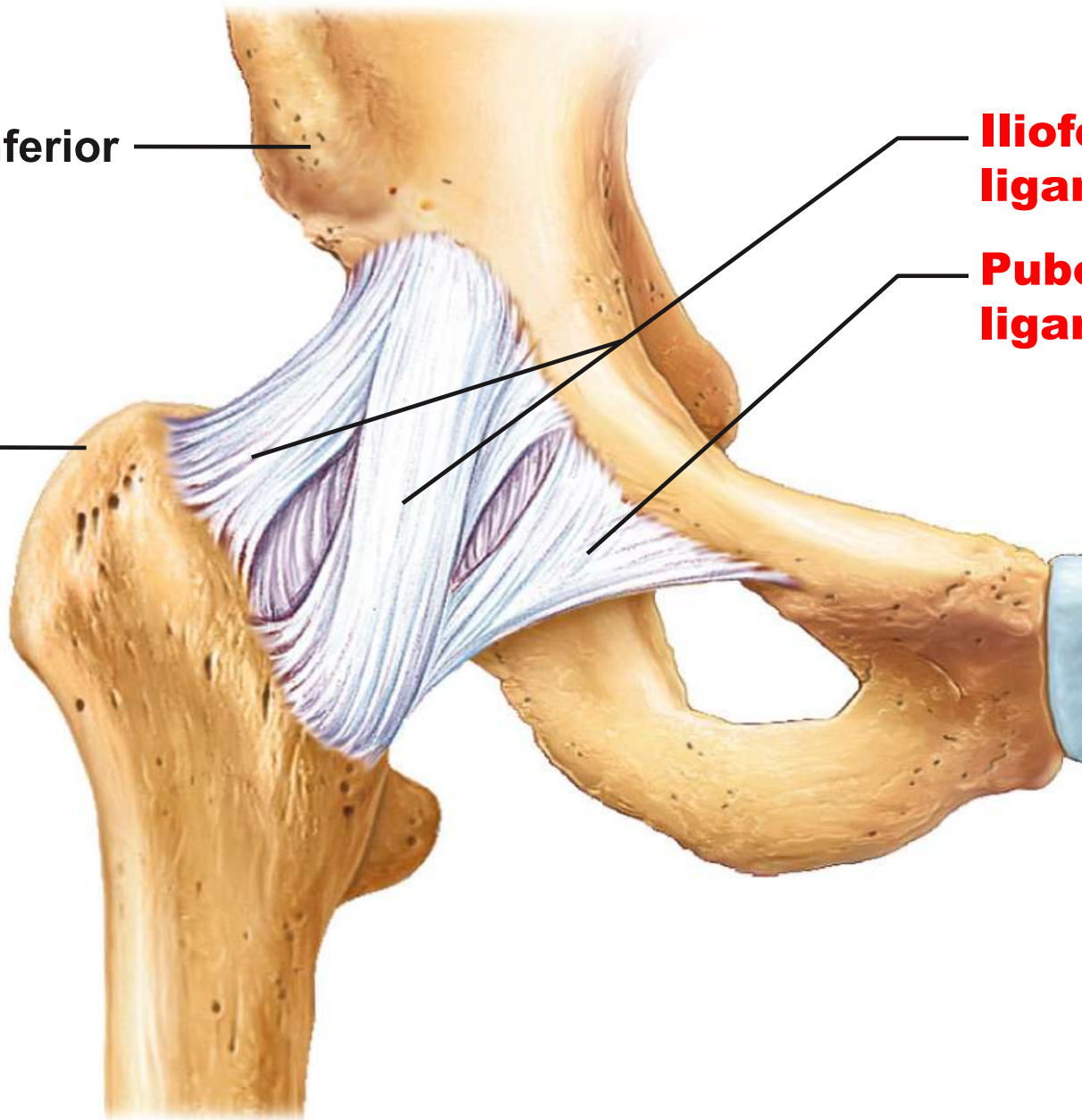
Animation: Rotating hip

**Anterior inferior  
iliac spine**

**Greater  
trochanter**

**Iliofemoral  
ligament**

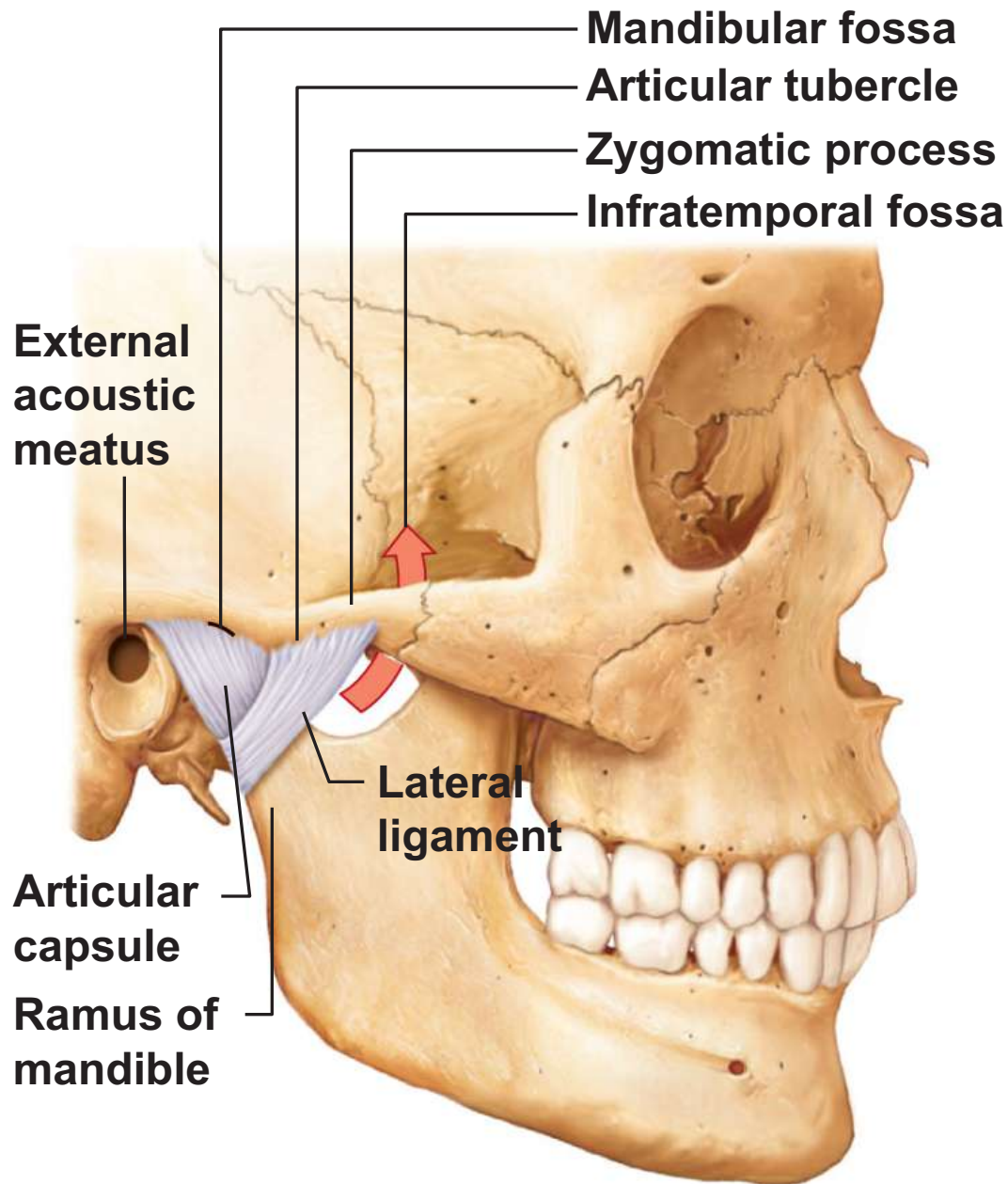
**Pubofemoral  
ligament**



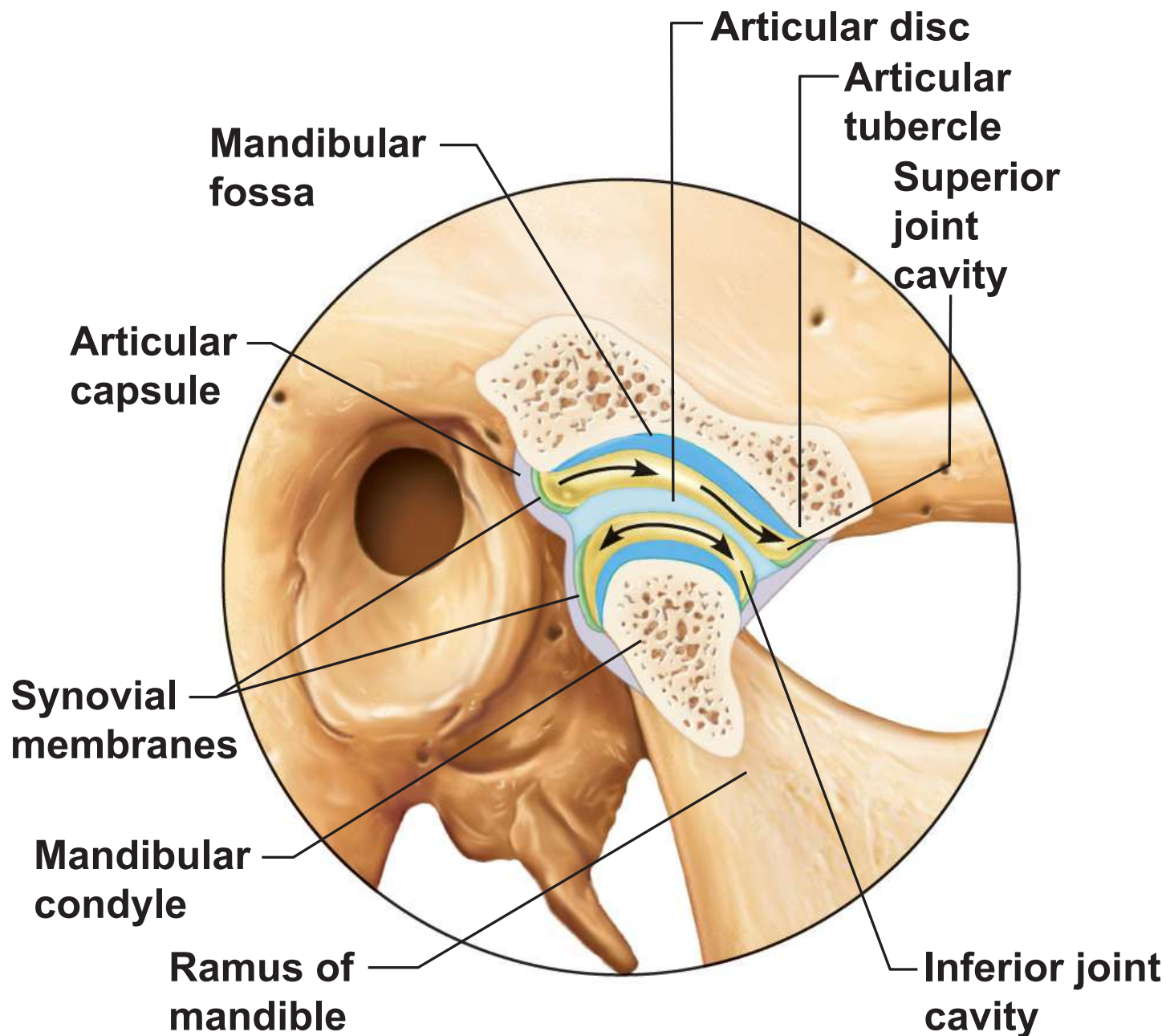
**(d) Anterior view of right hip joint, capsule in place**

# Temporomandibular Joint (TMJ)

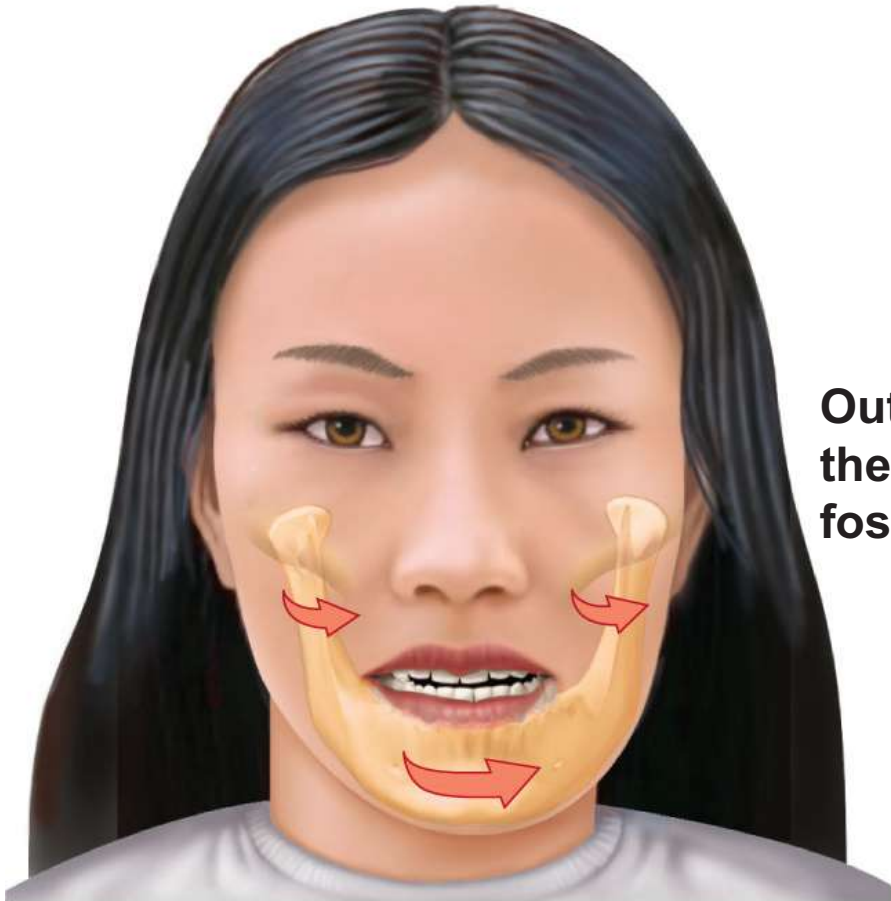
- Mandibular condyle articulates with the temporal bone
- Two types of movement
  - Hinge—depression and elevation of mandible
  - Gliding—e.g. side-to-side (lateral excursion) grinding of teeth
- Most easily dislocated joint in the body



**(a) Location of the joint in the skull**

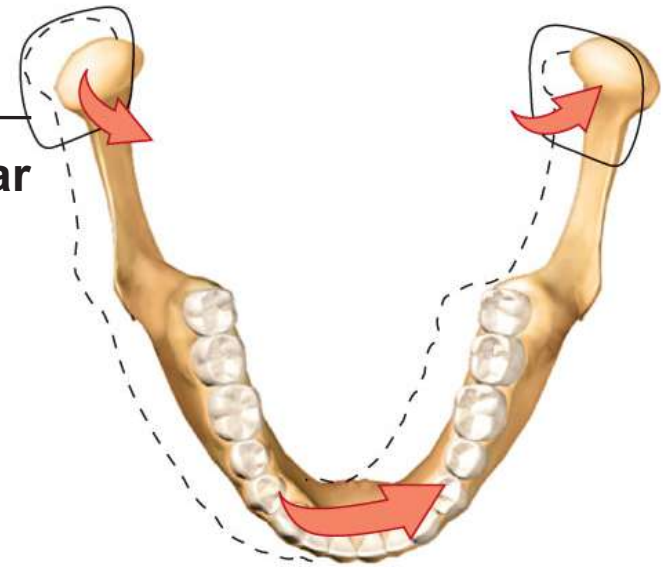


**(b) Enlargement of a sagittal section through the joint**



Outline of  
the mandibular  
fossa

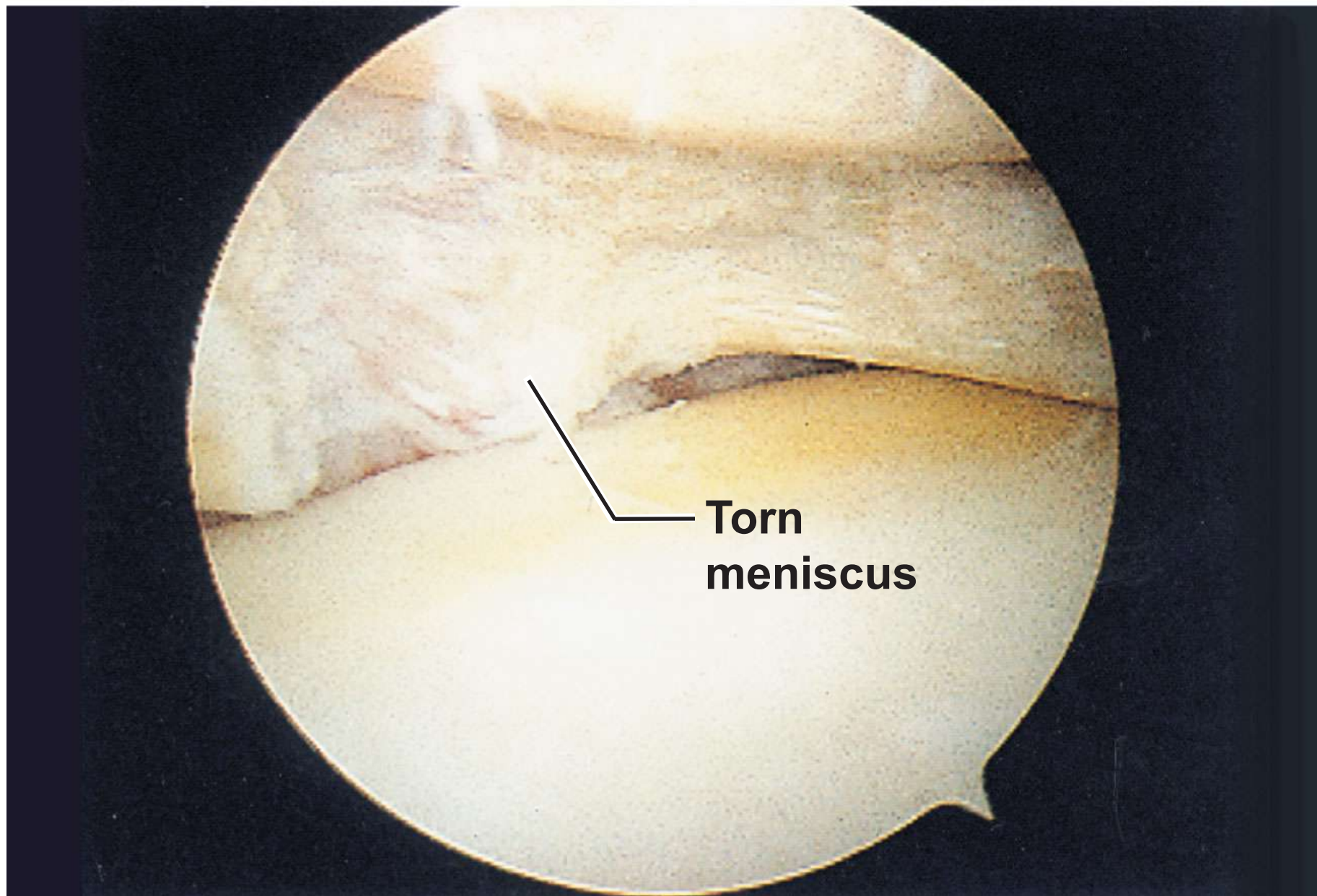
Superior view



**Lateral excursion: lateral (side-to-side) movements of the mandible**

# Common Joint Injuries

- **Sprains**
  - The ligaments are stretched or torn
  - Partial tears slowly repair themselves
  - Complete ruptures require prompt surgical repair
- **Cartilage tears**
  - Due to compression and shear stress
  - Fragments may cause joint to lock or bind
  - Cartilage rarely repairs itself
  - Repaired with arthroscopic surgery



# Common Joint Injuries

- **Dislocations (luxations)**
  - Occur when bones are forced out of alignment
  - Accompanied by sprains, inflammation, and joint immobilization
  - Caused by serious falls or playing sports
- **Subluxation**—partial dislocation of a joint

# Inflammatory and Degenerative Conditions

- **Bursitis**
  - An inflammation of a bursa, usually caused by a blow or friction
  - Treated with rest and ice and, if severe, anti-inflammatory drugs
- **Tendonitis**
  - Inflammation of tendon sheaths typically caused by overuse
  - Symptoms and treatment similar to bursitis

# Arthritis

- >100 different types of inflammatory or degenerative diseases that damage joints
- Most widespread crippling disease in the U.S.
- Symptoms; pain, stiffness, and swelling of a joint
- Acute forms: caused by bacteria, treated with antibiotics
- Chronic forms: osteoarthritis, rheumatoid arthritis, and gouty arthritis

# Osteoarthritis (OA)

- Common, irreversible, degenerative (“wear-and-tear”) arthritis
- 85% of all Americans develop OA, more women than men
- Probably related to the normal aging process
- More cartilage is destroyed than replaced in badly aligned or overworked joints
- Exposed bone ends thicken, enlarge, form bone spurs, and restrict movement
- Treatment: moderate activity, mild pain relievers, capsaicin creams, glucosamine and chondroitin sulfate

# Rheumatoid Arthritis (RA)

- Chronic, inflammatory, autoimmune disease of unknown cause
- Usually arises between age 40 and 50, but may occur at any age; affects 3 times as many women as men
- Signs and symptoms include joint pain and swelling (usually bilateral), anemia, osteoporosis, muscle weakness, and cardiovascular problems

# Rheumatoid Arthritis

- RA begins with synovitis of the affected joint
- Inflammatory blood cells migrate to the joint, release inflammatory chemicals
- Inflamed synovial membrane thickens into a pannus
- Pannus erodes cartilage, scar tissue forms, articulating bone ends connect (ankylosis)



**Figure 8.15**

# Rheumatoid Arthritis: Treatment

- Conservative therapy: aspirin, long-term use of antibiotics, and physical therapy
- Progressive treatment: anti-inflammatory drugs or immunosuppressants
- New biological response modifier drugs neutralize inflammatory chemicals

# Gouty Arthritis

- Deposition of uric acid crystals in joints and soft tissues, followed by inflammation
- More common in men
- Typically affects the joint at the base of the great toe
- In untreated gouty arthritis, the bone ends fuse and immobilize the joint
- Treatment: drugs, plenty of water, avoidance of alcohol

# Lyme Disease

- Caused by bacteria transmitted by the bites of ticks
- Symptoms: skin rash, flu-like symptoms, and foggy thinking
- May lead to joint pain and arthritis
- Treatment: antibiotics

# Developmental Aspects of Joints

- By embryonic week 8, synovial joints resemble adult joints
- A joint's size, shape, and flexibility are modified by use
- Advancing years take their toll on joints:
  - Ligaments and tendons shorten and weaken
  - Intervertebral discs become more likely to herniate
  - Most people in their 70s have some degree of OA
- Exercise that coaxes joints through their full range of motion is key to postponing joint problems